PATENT ABSTRACTS OF JAPAN

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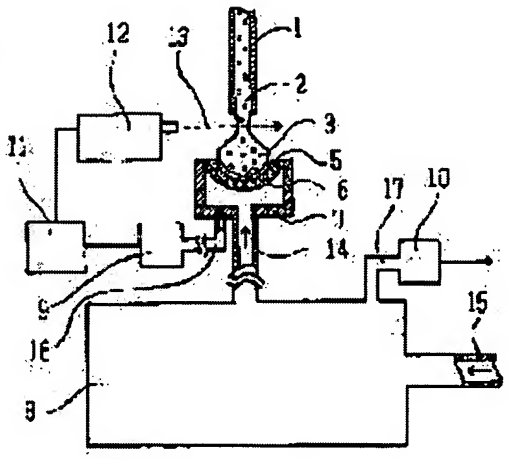
(54) FORMING OF GLASS GOB

(57)Abstract:

PURPOSE: To form a glass gob in high weight precision over a wide weight range by holding a glass gob on a forming mold in non-contacting state by the pressure of a gas stream ejected through small holes opened on the bottom of the mold and cutting the flowed-down glass when the pressure of the air stream reaches a prescribed level.



CONSTITUTION: Molten glass 2 is flowed down through a hot flow-down pipe 1 and charged into a forming mold 5. Air is passed through a tubular furnace 15 and pressed into a main pressure chamber 8. The air pressure in the chamber is measured by a sensor 10 and the result is fed back to a controlling mechanism to control the pressure at a definite level. Air is pressed through a tubular furnace 14 into a jacket 7 and blasted through small holes on the forming face 6 to form an air layer between the charged glass gob 3 and the forming face 6. The air pressure in the jacket 7 increasing with increase in the volume of the charged glass gob 3 is determined by a pressure gauge 9 and the signal is transmitted to a processor 11 and compared with a standard signal corresponding to the prescribed volume of the charged glass

gob 3. When both values are coincided with each other, a signal is transmitted to a laser beam radiation apparatus 12 and the flowed-down glass is cut with the laser beam 13.

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CLAIMS

[Claim(s)]
[Claim 1] It is made to flow down melting glass from an outflow pipe. The die inflow section of this flowing-down glass It holds pore maintaining a non-contact condition with the pressure of the jet gas from pore on the die which carries out opening and has a smooth shaping side. The shaping approach of the glass lump characterized by measuring the pressure or flow rate of a jet gas, cutting the above-mentioned flowing-down glass in the place where the value acquired from the measurement result reached the predetermined value, and holding the obtained melting glass lump, maintaining a non-contact condition with the pressure of the jet gas from pore on the above-mentioned die.
[Claim 2] The shaping approach of the glass lump according to claim 1 characterized by making it flow down, making it face to flow down melting glass from an outflow pipe, making the inferior surface of tongue of the control panel with which the lower part of an outflow pipe was equipped carry out are recording stagnation of the melting glass, and controlling free flowing down.
[Claim 3] The shaping approach of the glass lump according to claim 1 or 2 characterized by cutting by heating quickly the upper part of the die inflow section of flowing-down glass.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the approach of fabricating directly the glass lump which has a high weight precision over the large weight range, especially the glass lump which does not have defects, such as the Shache mark, a wrap, dirt, and a crack, in a front face in addition to the above-mentioned precision from melting glass.
[0002]
[Description of the Prior Art] Conventionally, the melting glass which flows out of a conduit continuously as a process of vitreous humours, such as a lens, is cut, press forming of the melting glass lump is carried out with the mold of the configuration near a desired lens etc., and the approach of making obtained preforming grinding and by grinding is learned. However, since it is easy to produce variation in a melting glass lump's weight by fluctuation of the exit velocity of the above-mentioned melting glass in such a process, the problem of requiring a great effort is in grinding and polish. Moreover, a melting glass lump drops and the approach of blowing off, receiving a gas in the state of non-contact, cooling from pore, with the die which has pore for this fall lump, and fabricating the above-mentioned vitreous humour is indicated carrying out natural dropping of the melting glass which flows down from an outflow pipe in order to, fabricate a vitreous humour without a crack or dirt directly from melting glass on a front face on the other hand at JP,2-14839,A, or by cutting with a cutting cutting edge. However, it is difficult to fabricate the vitreous humour with comparatively big weight which produces variation in the weight of a vitreous humour also in this approach, and cannot maintain an expected high precision easily, and does not have surface discontinuity.
[0003]
[Problem(s) to be Solved by the Invention] it aim at offer the approach of fabricate continuous still directly more easily the glass lump which this invention cancel many faults see by said conventional technique , do not have defects , such as the Shache mark , a wrap , dirt , and a crack , in a front face in addition to the glass lump which have a high weight precision over a large weight range , especially the above-mentioned precision , and be excellent in surface precision from melting glass .
[0004]
[Means for Solving the Problem] The fundamental design for the shaping approach of the glass lump concerning this invention for attaining said purpose It is made to flow down melting glass from an outflow pipe. The die inflow section of this flowing-down glass It holds pore maintaining a non-contact condition with the pressure of the jet gas from pore on the die which carries out opening and has a smooth shaping side. Measure the pressure or flow rate of a jet gas, and the above-mentioned flowing-down glass is cut in the place where the value acquired from the measurement result reached the predetermined value. It is in fabricating a glass lump by holding the obtained melting glass lump, maintaining a non-contact condition with the pressure of the jet gas from pore on the above-mentioned die. By the shaping approach of above-mentioned this invention, a glass lump's weight precision is stabilized and improves much more.

[0005] Although the glass lump of about [0.1-5g] small weight can be obtained when making it face in operation of the approach of this invention to flow down melting glass from an outflow pipe and making it flow down melting glass as it is from an outflow pipe As indicated by JP,57-57415,B which becomes application of these people A glass style will be stabilized if it is made to flow down, making the inferior surface of tongue of the control panel with which the lower part of an outflow pipe was equipped carry out are recording stagnation of the melting glass, and controlling free flowing down. Since the glass lump of the bigger weight to about 15g can be obtained, and the large time difference between each cutting process can be taken, shaping actuation can be performed exactly, and continuous molding of the glass lump excellent in the surface characteristic can be carried out more easily, it is desirable. In addition, if this control panel has the function which can control free flowing down of melting glass as above-mentioned, the thing of any configurations can be used for it.
[0006] Moreover, although well-known various artificial cutting process can be chosen in cutting of flowing-down glass if needed, in order to fabricate the glass lump which was further excellent in the surface characteristic, it is desirable to carry out rapid heating of the upper part of the die inflow section of flowing-down glass, and to cut it. As a means of rapid heating, energy sources, such as laser suitable for local intensive heating of a glass style, infrared radiation, a RF, or an acid hydrogen flame, are adjusted suitably, and can be used. When such energy is not obtained in an instant, predetermined energy is emitted beforehand, a reflecting mirror etc. may be operated, and you may irradiate.
[0007]
[Example] Hereafter, it is based on a drawing and the example of the shaping approach of the glass lump of this invention is explained.
(Example 1) In drawing 1 , the outflow pipe 1 with a bore of 8mm is connected to the glass melting basin which is not illustrated, and the well-known temperature control means which is platinum or a product made from a platinum alloy, and is not illustrated is attached. The die 5 with which it consists of a heat-resistant metal porosity member, much pores carry out opening under the outflow pipe 1, and the whole has the shaping side 6 (diameter of 10mm) of the shape of the smooth concave spherical surface is installed. The gas pressure necessary jacket 7 attaches to the die 5, the gas pressure necessary jacket 7 is opened for free passage by the former ** room 8 through a duct 14, and the former ** room 8 is opened for free passage by gas pressure close equipments, such as a compressor which was equipped with the pressure controller through the duct 15 and which is not illustrated. Between the outflow pipe 1 and the die 5, the laser-beam irradiation equipment 12 for flowing-down glass cutting is arranged. The pressure survey machines 9 and 10 of an elastic-deformation method capacity mold are opened for free passage by the gas pressure necessary jacket 7 and the former ** room 8 through the ducts 16 and 17 for pressure surveies. It has connected with an arithmetic unit 11 and the pressure survey machine 9 has connected the arithmetic unit 11 to laser-beam irradiation equipment 12. The pressure survey machine 10 is connected to the pressure controller which is not illustrated.
[0008] Heat the melting glass 2 of the barium crown system which is first led to the outflow pipe 1 and flows down with the outflow pipe 1 using the above-mentioned shaping equipment, and it is made to flow down from a pipe 1, controlling to the temperature of the viscosity of 42P, and is made to flow into a die 5. Under the present circumstances, press air fit in the former ** room 8 through a duct 15 from the gas pressure close equipment which has not been illustrated beforehand, measure the pneumatic pressure in the former ** room 8 with the pressure survey machine 10, and it feeds back to the pressure controller which is not illustrating that measurement result. Controlling the amount of air press fits so that the pressure in the former ** room 8 becomes fixed, press air fit in a jacket 7 through a duct 14 from the former ** room 8, it is made to blow off from the pore of the shaping side 6, and the air space is made to form between the glass inflow section 3 to a die 5, and the shaping side 6. Subsequently, the pneumatic pressure in the jacket 7 which becomes high with increase of the glass inflow section 3 is measured with the pressure survey machine 9, the signal generated corresponding to this pressure is transmitted to an arithmetic unit 11, the reference signal which is equivalent to the predetermined volume of the above-mentioned signal and the glass inflow section 3 with an arithmetic unit 11 is compared, and when both signals agree, an active signal is transmitted to laser-beam irradiation equipment 12 from an arithmetic

unit 11. The predetermined location of the upper part of the glass inflow section 3 is irradiated, rapid heating of the laser beam 13 is carried out as a broken line shows drawing from laser-beam irradiation equipment 12 based on the above-mentioned active signal, flowing-down glass 2 is cut, and the melting glass lump 4 obtained by cutting is held, maintaining the shaping side 6 and a non-contact condition on a die 5 as shown in drawing 2 . Then, a die 5 is immediately moved to a longitudinal direction with the melting glass lump 4, a new die is arranged in the lower part of the outflow pipe 1, and it prepares for the next cutting glass lump's fall. After the front face of the melting glass lump 4 which held on the die 5 cools to the temperature below softening temperature, it takes out from a die 5 and a convex lens-like glass lump is obtained. A glass lump's obtained weight was 732mg**1.4mg, and weight precision was **0.2%. This precision was extremely stable during continuous molding. Moreover, when a glass lump's front face was observed with the optical microscope, it was what there are no defects, such as the Shache mark, a wrap, dirt, and a crack, and can be used as it is as preforming for mold press forming.

[0009] (Example 2) Drawing 3 is other example explanatory views of the shaping approach of the glass lump of this invention. In drawing, control panel 1' of the shape of a water disk with a diameter of 16mm is attached at the tip of the outflow pipe 1 with a bore of 10mm, and each of these is platinum or a product made from a platinum alloy. The die 5 with which it consists of a heat-resistant metal porosity member, much pores carry out opening under control panel 1', and the whole has the shaping side 6 (diameter of 25mm) of the shape of the smooth concave spherical surface is prepared. The gas pressure necessary jacket 7 attaches to the die 5, the gas pressure necessary jacket 7 is opened for free passage by the former ** room 8 through a duct 14, and the former ** room 8 is opened for free passage by gas pressure close equipments, such as a compressor which was equipped with the pressure controller through the duct 15 and which is not illustrated. Infrared irradiation equipment 12' is arranged between control panel 1' and a die 5. Thermal-method-of-flow-measurement machine 9' is opened for free passage by the duct 14 through the duct 16 for hydrometry, and the pressure survey machine 10 of an elastic-deformation method capacity mold is opened for free passage by the former ** room 8 through the duct 17 for pressure surveies. Thermal-method-of-flow-measurement machine 9' is connected to an arithmetic unit 11, and the arithmetic unit 11 is connected to infrared irradiation equipment 12'. The pressure survey machine 10 is connected to the pressure controller which is not illustrated.

[0010] It is made to flow down, controlling the melting glass 2 of the Flint system led to the pipe 1 to viscosity the potential equivalent temperature of 450P using above shaping equipment, and the inferior surface of tongue of control panel 1' is made to carry out are recording stagnation temporarily. Subsequently, the glass which piled up in the inferior surface of tongue of control panel 1' begins free flowing down, and flows into a die 5. Under the present circumstances, press air fit in the former ** room 8 through a duct 15 from the gas pressure close equipment which has not been illustrated beforehand, measure the pressure in the former ** room 8 with the pressure survey machine 10, and it feeds back to the pressure controller which is not illustrating that measurement result. Controlling the amount of air press fits so that the pressure in the former ** room 8 becomes fixed, press air fit in a jacket 7 through a duct 14 from the former ** room 8, it is made to blow off from the pore of the shaping side 6, and the air space is made to form between the glass inflow section 3 to a die 5, and the shaping side 6. Subsequently, measure the air flow rate in the duct 14 which decreases with increase of the glass inflow section 3 by hydrometry machine 9', and the signal generated corresponding to this flow rate is transmitted to an arithmetic unit 11. The reference signal which is equivalent to the predetermined volume of the above-mentioned signal and the glass inflow section 3 with an arithmetic unit 11 is compared. When both signals agree, an active signal is transmitted to infrared irradiation equipment 12' from an arithmetic unit 11. The predetermined location of the upper part of the glass inflow section 3 is irradiated, rapid heating of infrared 13' is carried out as a broken line shows drawing, flowing-down glass 2 is cut, the melting glass lump obtained by cutting like the example 1 is held on a die, and a convex lens-like glass lump is fabricated. A glass lump's obtained weight was 10.020g**0.050g, and weight precision was **0.5%. This precision was extremely stable during continuous molding. Moreover, when a glass lump's front face was observed with the optical microscope, it was what a front face does not have defects, such as the Shache mark, a wrap, dirt, and a crack, and can be used as it is as

preforming for mold press forming.
[0011] As mentioned above, although the example of this invention was explained, without being limited to the above-mentioned example, within the limits of the technical thought of said this invention, a condition change is made variously and the manufacture approach of the glass lump of this invention can be enforced. For example, inert gas, such as N2 and Ar, is sufficient as the gas made to blow off from pore in addition to air. Moreover, various pressure survey machines other than an elastic-deformation mold, such as an electric resistance mold, a piezoelectricity mold, and a magnetostriction mold, can be used for measurement of the gas pressure force, and various kinds of hydrometry machines or rate-of-flow measurement machines can be used for measurement of a gas flow rate. Moreover, in each manufacture process of the glass lump of this invention, addition application of various well-known techniques can be carried out.
[0012]
[Effect of the Invention] As above-mentioned, the shaping approach of the glass lump of this invention It is made to flow down melting glass from an outflow pipe. The die inflow section of this flowing-down glass It holds pore maintaining a non-contact condition with the pressure of the jet gas from pore on the die which carries out opening and has a smooth shaping side. Measure the pressure or flow rate of a jet gas, and the above-mentioned flowing-down glass is cut in the place where the value acquired from the measurement result reached the predetermined value. Since it is the approach of holding the obtained melting glass lump, maintaining a non-contact condition with the pressure of the jet gas from pore on a die Over the large weight range, weight precision is high and the glass lump of the high quality which does not have defects, such as the Shache mark, a wrap, dirt, and a crack, in a front face can be fabricated continuously. This glass lump is suitable to use an optical element as preforming at the time of carrying out mold press forming.

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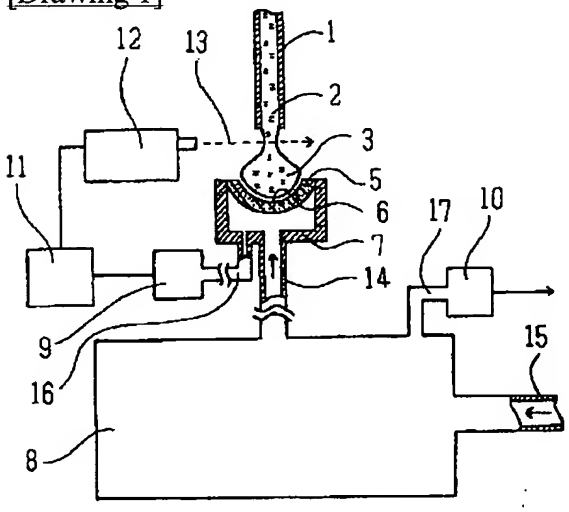
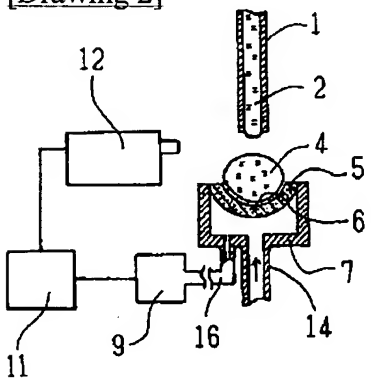
DRAWINGS

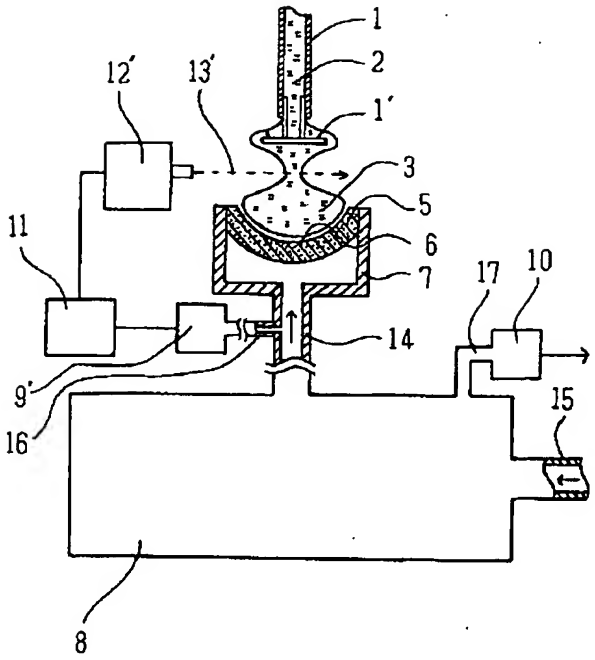
[Drawing 1]



[Drawing 2]



[Drawing 3]



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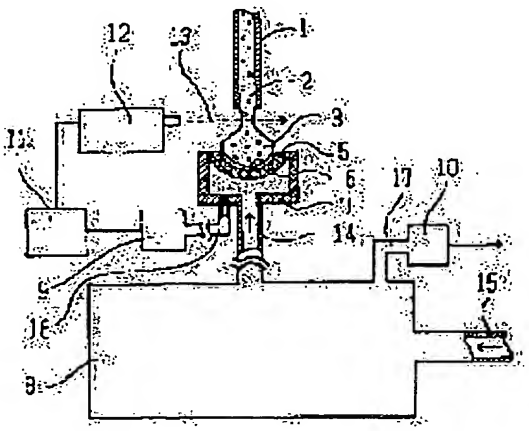
(54) FORMING OF GLASS GOB

(57)Abstract:
PURPOSE: To form a glass gob in high weight precision over a wide weight range by holding a glass gob on a forming mold in non-contacting state by the pressure of a gas stream ejected through small holes opened on the bottom of the mold and cutting the flowed-down glass when the pressure of the air stream reaches a prescribed level.
CONSTITUTION: Molten glass 2 is flowed down through a hot flow-down pipe 1 and charged into a forming mold 5. Air is passed through a tubular furnace 15 and pressed into a main pressure chamber 8. The air pressure in the chamber is measured by a sensor 10 and the result is fed back to a controlling mechanism to control the pressure at a definite level. Air is pressed through a tubular furnace 14 into a jacket 7 and blasted through small holes on the forming face 6 to form an air layer between the charged glass gob 3 and the forming face 6. The air pressure in the jacket 7 increasing with increase in the volume of the charged glass gob 3 is determined by a pressure gauge 9 and the signal is transmitted to a processor 11 and compared with a standard signal corresponding to the prescribed volume of the charged glass gob 3. When both values are coincided with each other, a signal is transmitted to a laser beam radiation apparatus 12 and the flowed-down glass is cut with the laser beam 13.



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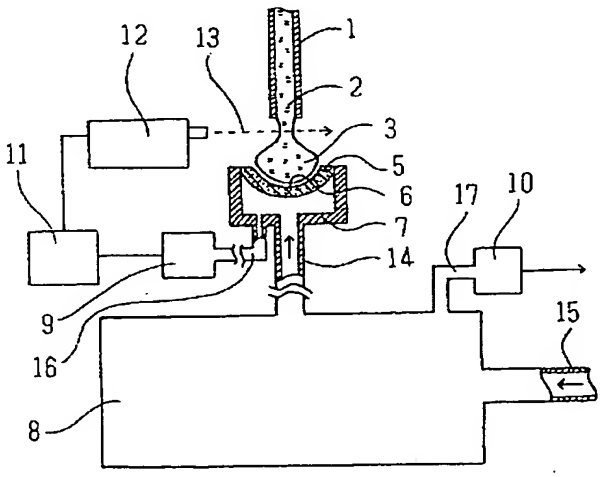
最終頁に続く

(54)【発明の名称】　ガラス塊の成形方法

(57)【要約】

【目的】　溶融ガラスから連続的にガラス塊を成形するに際し、広い重量範囲にわたって高い重量精度を有するガラス塊を成形し得る方法を提供すること。

【構成】　パイプから流下する溶融ガラスを細孔が開口している成形面を有する成形型上に細孔からの噴出気体の圧力により非接触状態で保持し、噴出気体の圧力または流量を測定し、その測定結果から得られる値が所定値に達したとき流下ガラスを切断し、得られた溶融ガラス塊を上記成形型上に細孔からの噴出気体の圧力により非接触状態で保持すること。



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【特許請求の範囲】

【請求項１】　流出パイプから溶融ガラスを流下させ、この流下ガラスの成形型流入部を、細孔が開口し平滑な成形面を有する成形型上に細孔からの噴出気体の圧力により非接触状態を保ちつつ保持し、噴出気体の圧力または流量を測定し、その測定結果から得られる値が所定値に達したところで上記流下ガラスを切断し、得られた溶融ガラス塊を上記成形型上に細孔からの噴出気体の圧力により非接触状態を保ちつつ保持することを特徴とするガラス塊の成形方法。

【請求項２】　流出パイプから溶融ガラスを流下させるに際し、流出パイプの下部に備えた制御盤の下面に溶融ガラスを蓄積滞留させて自由流下を制御しつつ、流下させることを特徴とする請求項１に記載のガラス塊の成形方法。

【請求項３】　流下ガラスの成形型流入部の上部を急速に加熱することにより切断することを特徴とする請求項１または請求項２に記載のガラス塊の成形方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、広い重量範囲にわたって高い重量精度を有するガラス塊、特に上記精度に加え表面にシャーマーク、折込み、汚れおよびキズ等の欠陥のないガラス塊を溶融ガラスから直接成形する方法に関する。

【０００２】

【従来の技術】従来、レンズ等のガラス体の製法として、例えば導管から連続的に流出する溶融ガラスを切断し、所望のレンズ等に近い形状の型で溶融ガラス塊をプレス成形し、得られたプリフォームを研削、研磨することによって作る方法が知られている。しかし、このような製法では上記溶融ガラスの流出速度の変動により溶融ガラス塊の重量にバラツキを生じ易いので、研削、研磨に多大の労力を要するという問題がある。また一方、特開平２－１４８３９号公報には、表面にキズや汚れのないガラス体を溶融ガラスから直接成形するため、流出パイプから流下する溶融ガラスを自然滴下させることによって、あるいは切断刃で切断することによって溶融ガラス塊を落下させ、この落下塊を細孔を有する成形型で細孔から気体を吹き出し非接触状態で受け、冷却して上記ガラス体を成形する方法が開示されている。しかし、この方法においてもガラス体の重量にバラツキを生じ、所期の高い精度を維持し難く、また表面欠陥のない比較的重量の大きなガラス体を成形することは困難である。

【０００３】

【発明が解決しようとする課題】本発明は前記従来技術にみられる諸欠点を解消し、広い重量範囲にわたって高い重量精度を有するガラス塊、特に上記精度に加え、表面にシャーマーク、折込み、汚れおよびキズ等の欠陥がなく表面精度に優れたガラス塊を溶融ガラスから直接連続的に一層容易に成形する方法を提供することを目的とする。

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【０００４】

【課題を解決するための手段】前記目的を達成するための本発明にかかるガラス塊の成形方法の基本的構想は、流出パイプから溶融ガラスを流下させ、この流下ガラスの成形型流入部を、細孔が開口し平滑な成形面を有する成形型上に細孔からの噴出気体の圧力により非接触状態を保ちつつ保持し、噴出気体の圧力または流量を測定し、その測定結果から得られる値が所定値に達したところで上記流下ガラスを切断し、得られた溶融ガラス塊を上記成形型上に細孔からの噴出気体の圧力により非接触状態を保ちつつ保持することによりガラス塊を成形することにある。上記本発明の成形方法により、ガラス塊の重量精度は安定して一段と向上する。

【０００５】本発明の方法の実施にあたって、流出パイプから溶融ガラスを流下させるに際し、流出パイプからそのまま溶融ガラスを流下させる場合は、０．１～５ｇ程度の小重量のガラス塊を得ることができるが、本出願人の出願になる特公昭５７－５７４１５号公報に開示されているように、流出パイプの下部に備えた制御盤の下面に溶融ガラスを蓄積滞留させて自由流下を制御しつつ流下させるとガラス流が安定し、約１５ｇ程度までの一段と大きな重量のガラス塊を得ることができ、また各切断工程間の時間差が大きくとれ、成形操作を的確に行うことができるため、表面特性に優れたガラス塊をより容易に連続成形することができるので好ましい。なお、この制御盤は、上記のとおり溶融ガラスの自由流下を制御し得る機能を有するものであれば、どの様な形状のものも採用し得る。

【０００６】また、流下ガラスの切断にあたり、必要に応じ公知の種々の人工切断方法を選択することができるが、さらに表面特性に優れたガラス塊を成形するためには、流下ガラスの成形型流入部の上部を急速加熱して切断することが好ましい。急速加熱の手段として、ガラス流の局部集中加熱に適したレーザー、赤外放射、高周波または酸水素火炎等のエネルギー源を適宜調整して利用し得る。これらのエネルギーが瞬時に得られない場合は、予め所定エネルギーを放射しておき反射鏡等を作動させて照射してもよい。

【０００７】

【実施例】以下、本発明のガラス塊の成形方法の実施例を図面に即し説明する。

（実施例１）図１において、内径８ｍｍの流出パイプ１は図示していないガラス溶融槽に接続されており、白金または白金合金製であり、また図示していない公知の温度制御手段が付設されている。流出パイプ１の下方には、耐熱金属製多孔質部材からなり、多数の細孔が開口し全体が平滑な凹球面状の成形面６（直径１０ｍｍ）を有する成形型５が設置されている。成形型５には気体圧

入用ジャケット７が付帯されており、気体圧入用ジャケット７は管路１４を介して元圧室８に連通され、元圧室８は管路１５を介して圧力制御装置を備えた図示していないコンプレッサー等の気体圧入装置に連通されている。流出パイプ１と成形型５との間には、流下ガラス切断用レーザービーム照射装置１２が配置されている。弾性変形方式容量型の圧力測定機９および１０は、圧力測定用の管路１６および１７を介して気体圧入用ジャケット７および元圧室８に連通されている。圧力測定機９は演算装置１１に接続しており、演算装置１１はレーザービーム照射装置１２に接続している。圧力測定機１０は図示していない圧力制御装置に接続している。

【０００８】上記成形装置を用い、まず流出パイプ１に導かれて流下するバリウムクラウン系の溶融ガラス２を流出パイプ１により加熱し、粘度４２ポアズ相当の温度に制御しながらパイプ１から流下させ、成形型５に流入させる。この際、予め図示していない気体圧入装置から管路１５を経て元圧室８内に空気を圧入し、元圧室８内の空気圧を圧力測定機１０により測定し、その測定結果を図示していない圧力制御装置にフィードバックして、元圧室８内の圧力が一定となるように空気圧入量を制御しつつ、元圧室８から管路１４を経てジャケット７内に空気を圧入して成形面６の細孔から噴出させ、成形型５へのガラス流入部３と成形面６との間に空気層を形成させておく。ついでガラス流入部３の増大とともに高くなるジャケット７内の空気圧を圧力測定機９により測定し、該圧力に対応して発生する信号を演算装置１１に送信し、演算装置１１により上記信号とガラス流入部３の所定体積に相当する基準信号とを比較して、両信号が合致したとき演算装置１１からレーザービーム照射装置１２に作動信号を送信する。上記作動信号に基づき、レーザービーム照射装置１２から図において破線で示すとおり、レーザービーム１３をガラス流入部３の上部の所定位置に照射して急速加熱し、流下ガラス２を切断し、図２に示すとおり切断により得られた溶融ガラス塊４を成形型５上に成形面６と非接触状態を保ちつつ保持する。その後、直ちに成形型５を溶融ガラス塊４とともに横方向に移動し、流出パイプ１の下方には新たな成形型を配置し、次の切断ガラス塊の落下に備える。成形型５上に保持した溶融ガラス塊４の表面が軟化点以下の温度まで冷却した後、成形型５から取り出し、凸レンズ状のガラス塊を得る。得られたガラス塊の重量は、７３２ｍｇ±１．４ｍｇであり、重量精度は±０．２％であった。この精度は連続成形中極めて安定していた。また、ガラス塊の表面を光学顕微鏡で観察したところ、シャーマーク、折込み、汚れおよびキズ等の欠陥がなく、モールドプレス成形用プリフォームとしてそのまま使用できるものであった。

【０００９】（実施例２）図３は、本発明のガラス塊の成形方法の他の実施例説明図である。図において、内径

１０ｍｍの流出パイプ１の先端に直径１６ｍｍの水平円板状の制御盤１′が取り付けられており、これらはいずれも白金または白金合金製である。制御盤１′の下方には、耐熱金属製多孔質部材からなり多数の細孔が開口し全体が平滑な凹球面状の成形面６（直径２５ｍｍ）を有する成形型５が用意されている。成形型５には気体圧入用ジャケット７が付帯されており、気体圧入用ジャケット７は管路１４を介して元圧室８に連通され、元圧室８は管路１５を介して圧力制御装置を備えた図示していないコンプレッサー等の気体圧入装置に連通されている。制御盤１′と成形型５との間には、赤外線照射装置１２′が配置されている。熱式流量測定機９′は、流量測定用の管路１６を介して管路１４に連通されており、弾性変形方式容量型の圧力測定機１０は圧力測定用の管路１７を介して元圧室８に連通されている。熱式流量測定機９′は、演算装置１１に接続しており、演算装置１１は赤外線照射装置１２′に接続している。圧力測定機１０は図示していない圧力制御装置に接続している。

【００１０】上記の成形装置を用いて、パイプ１に導かれたフリント系の溶融ガラス２を粘度４５０ポアズ相当温度に制御しながら流下させ、制御盤１′の下面に一時蓄積滞留させる。ついで制御盤１′の下面に滞留したガラスは自由流下を始め成形型５に流入する。この際、予め図示していない気体圧入装置から管路１５を経て元圧室８内に空気を圧入し、元圧室８内の圧力を圧力測定機１０により測定し、その測定結果を図示していない圧力制御装置にフィードバックして、元圧室８内の圧力が一定となるように空気圧入量を制御しつつ、元圧室８から管路１４を経てジャケット７内に空気を圧入して成形面６の細孔から噴出させ、成形型５へのガラス流入部３と成形面６との間に空気層を形成させておく。ついでガラス流入部３の増大とともに少なくなる管路１４内の空気流量を流量測定機９′により測定し、該流量に対応して発生する信号を演算装置１１に送信して、演算装置１１により上記信号とガラス流入部３の所定体積に相当する基準信号とを比較し、両信号が合致したとき演算装置１１から赤外線照射装置１２′に作動信号を送信し、図において破線で示すとおり赤外線１３′をガラス流入部３の上部の所定位置に照射して急速加熱し、流下ガラス２を切断し、実施例１と同様に切断によって得られた溶融ガラス塊を成形型上に保持して凸レンズ状のガラス塊を成形する。得られたガラス塊の重量は、１０．０２０ｇ±０．０５０ｇであり、重量精度は±０．５％であった。この精度は連続成形中極めて安定していた。また、ガラス塊の表面を光学顕微鏡で観察したところ、表面にシャーマーク、折込み、汚れおよびキズ等の欠陥がなく、モールドプレス成形用プリフォームとしてそのまま使用できるものであった。

【００１１】以上、本発明の実施例について説明したが、本発明のガラス塊の製造方法は上記実施例に限定さ

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れることなく、前記本発明の技術思想の範囲内で種々条件変更して実施し得る。例えば細孔から噴出させる気体は、空気以外にN_2やＡｒ等の不活性ガスでもよい。また、気体圧力の測定には弾性変形型の他に電気抵抗型、ピエゾ電気型、磁歪型等の各種圧力測定機を用いることができ、気体流量の測定には各種の流量測定機または流速測定機を用いることができる。また、本発明のガラス塊の各製造過程において、公知の技術を種々付加適用することができる。

【００１２】

【発明の効果】上述のとおり、本発明のガラス塊の成形方法は、流出パイプから溶融ガラスを流下させ、この流下ガラスの成形型流入部を、細孔が開口し平滑な成形面を有する成形型上に細孔からの噴出気体の圧力により非接触状態を保ちつつ保持し、噴出気体の圧力または流量を測定し、その測定結果から得られる値が所定値に達したところで上記流下ガラスを切断し、得られた溶融ガラス塊を成形型上で細孔からの噴出気体の圧力により非接触状態を保ちつつ保持する方法であるから、広い重量範囲にわたって重量精度が高く、表面にシャーマーク、折込み、汚れおよびキズ等の欠陥のない高品質のガラス塊を連続的に成形することができる。このガラス塊は、光学素子をモールドプレス成形する際のプリフォームとして用いるのに好適である。

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【図面の簡単な説明】

【図１】本発明の方法の一実施例を示す一部側縦断面説明図である。

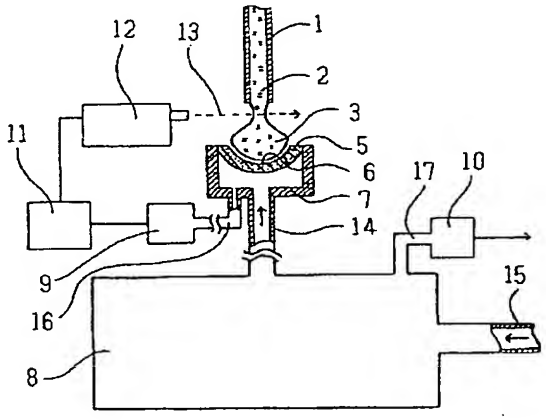
【図２】同じく上記実施例を示す同様の説明図である。

【図３】本発明の方法の他の実施例を示す同様の説明図である。

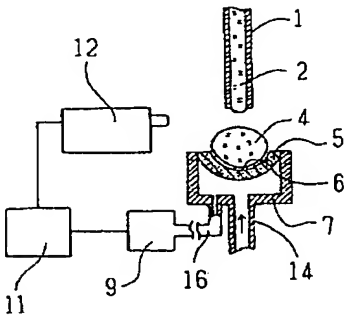
【符号の説明】

１　流出パイプ
１′　制御盤
２　溶融ガラス
３　成形型流入部
４　溶融ガラス塊
５　成形型
６　成形面
７　気体圧入用ジャケット
９、１０　圧力測定機
９′　流量測定機
１１　演算装置
１２　レーザービーム照射装置
１２′　赤外線照射装置
１３　レーザービーム
１３′　赤外線

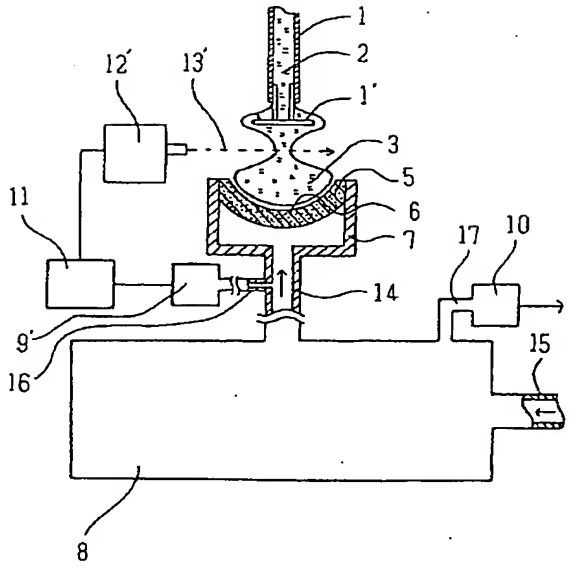
【図１】



【図２】



【図３】



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